The Commission directed Commission staff to send a data request to the other major investor-owned utilities as to their practices in situations where they are delivering services to an unbilled account or suspect a meter is not functioning properly.

The Commission directed the Division of Water, Compliance and Consumer Affairs to draft an order consistent with its discussion.

6680-DR-111 – Wisconsin Power and Light Company's Petition to the Public Service Commission for Declaratory Ruling as to the Interpretation of Wis. Stat. § 196.495(3) and its Application in Conjunction with Wis. Admin. Code § PSC 112.08(1)

The Commission closed its docket regarding a petition from Wisconsin Power and Light Company for a declaratory ruling to interpret the anti-duplication statute and the Commission's corresponding rule.

The Commission directed Commission staff to draft an order consistent with its discussion.

5-GF-191 – Quadrennial Planning Process

Phase 2 – Evaluation Issues

The Commission discussed the issues in this docket and made determinations, including the following:

1. The existing three Focus on Energy evaluation goals shall be retained. Special emphasis is to be placed on (1) documenting energy and peak savings attributable to the program; (2) documenting whether statutory goals have been met; (3) providing data needed to assess cost-effectiveness; and (4) providing on-going feedback and analysis to the program administrator. An Evaluation Working Group comprised of evaluators and other interested parties shall be established to address evaluation issues over time.

2. The maximum six-member Working Group will be advisory and consist of the following: a member of Commission staff to be appointed by the Administrator of the Gas and Energy Division to serve as chair; George Edgar (if he is willing to serve); the program administrator; the evaluation consultant; and a representative from the utilities. If two program administrators become necessary in the future (one for residential and one for business), it may be appropriate to have a member from each serve on the Working Group.

3. The Working Group shall recommend new guidelines for selecting the appropriate attribution measurement methods. The recommendations should be brought back to the Commission for review.

4. The Working Group shall also review the current application of the self-report and market data methods being used in other states and recommend changes to be implemented in Wisconsin. It shall also review evaluation plans to ensure that they meet the new evaluation framework. The recommendations should be brought back to the Commission for review.

5. The Working Group should also review the methods used to measure gross savings and recommend changes. The recommendations should be brought back to the Commission for review.

6. Net savings are appropriate in determining cost-effectiveness, to inform continual improvement of program design, and for public policy making. Gross metrics are appropriate in the context of contract goals.

7. Life cycle-savings goals for energy efficiency and renewable resource programs shall be established. First year savings shall be made available for public reporting purposes.

8. The current effective useful life approach and decay rate approach will be continued to document life-cycle savings. The Working Group shall consider alternatives to the current approach and recommend modifications. The recommendations should be brought back to the Commission for review.

9. A modified total resource cost (TRC) test at the measure and portfolio levels is appropriate. It is appropriate to continue to report results of the Expanded test at the portfolio level. A utility/administrator test at the program level should also be conducted to inform program design. Measures that do not pass the modified TRC test, but have substantial non-energy benefits, may be considered for program inclusion on a case-by-case basis, based on the Expanded test.

10. Avoided energy costs will be based on the most recent three-year historical average of locational marginal pricing and avoided capacity costs on the cost of a new peaking plant.

11. A discount rate of 2 percent will be used for benefit/cost modeling of energy efficiency programs.

12. Using a levelized carbon value of $30 per ton for this quadrennial planning horizon strikes the appropriate balance between the market value of carbon and reflecting the need for emission reductions.

13. The cost-effectiveness of renewable resources should be determined in the same manner as energy efficiency, but public policy should dictate the extent to which renewable resources that are not cost-effective should be included in the portfolio of programs in order to meet public policy objectives. Commission staff is directed to prepare proposed criteria to be brought back to the Commission for further review.

The Commission directed Commission staff to draft a memorandum consistent with its discussion.

The Commission adjourned the meeting at 11:18 a.m.

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Sandra J. Paske
Secretary to the Commission

PUBLIC SERVICE COMMISSION OF WISCONSIN

Memorandum

June 8, 2010

#7
7-8-10

FOR COMMISSION AGENDA

TO: The Commission

FROM: Robert Norcross, Administrator
Carol Stemrich, Assistant Administrator
Jolene Sheil, Focus on Energy Program Manager
Gas and Energy Division

RE: Quadrennial Planning Process 5-GF-191

Phase 2 – Evaluation Issues

Suggested Minute: The Commission directed the Gas and Energy Division to draft an order in accordance with its discussion.

Evaluation Issues

Background

In Phase 1 of the Quadrennial Planning Process, the Commission decided it would first establish energy savings goals for energy efficiency and customer-sited renewable resource programs,[1] and then determine the funding commitments necessary to achieve those goals. This is a departure from the previous practice of establishing funding commitments based on the default statutory formula (1.2 percent of annual operating revenues), and it introduces new and complex issues for the planning and program evaluation processes.

In particular, the question of how to value and measure "savings" is not a simple one, nor is it a question that has only one right answer. But in order to set appropriate energy efficiency and renewable resource savings goals, and the corresponding budgets to achieve those goals, it is essential for the Commission to be specific about how savings will be valued and measured. For

[1] The "energy savings" for customer-sited renewable resource programs represents the reduction in kW, kWh, and therms that a utility needs to produce or purchase.

example, the budget necessary to achieve a given amount of "net savings" might be substantially different than the budget necessary to achieve the same amount of "gross savings." (This distinction and others will be detailed later in this memo.) A failure to be specific on program evaluation methods could lead to confusion, contract disputes, or doubts about the true value of the programs.

The importance of energy savings valuation and measurement to the establishment of goals is discussed by several parties in their responses to the Commission's questions regarding the appropriate level of energy efficiency and renewable resource goals and budgets. For example, the Joint Public Intervenors (JPI) assume in their comments regarding the appropriate level of goals and budgets that Wisconsin's current method of measuring the impacts resulting from energy efficiency and renewable energy programs will be modified some time after the start of the 2011-2014 planning period, to bring it more in line with methods used in other states. JPI comments are also based on the assumption that the Commission will improve the inputs currently used to assess the cost-effectiveness of energy efficiency and renewable resource programs.

The Commission recognized the importance of evaluation issues in this proceeding by including the following two evaluation questions in its Notice:

- What should be the goals of the energy efficiency and renewable resource evaluation?
- What are the appropriate evaluation metrics to measure achievement of each goal and measureable target?

In order to assist Commission staff in formulating alternatives for the Commission to consider regarding the second bulleted question, Commission staff gathered input from evaluation experts around the country. This request and the input received will be discussed further in the evaluation metrics section of this memo.

Additionally, on May 21, 2010, comments on a draft of this memo were solicited from interested stakeholders. Comments were received from the Wisconsin Utilities Association (WUA), Wisconsin Energy Conservation Corporation (WECC), the Industrial Customer Groups (ICG), JPI, and Tom Wilson of Residential Energy Services, a contractor of WECC. The ICG consists of Wisconsin Industrial Energy Group, Inc., Wisconsin Manufacturers & Commerce, and the Wisconsin Paper Council. JPI is comprised of the Citizens' Utility Board, Clean Wisconsin, and RENEW Wisconsin.

I. What should be the goals of the energy efficiency and renewable resource program evaluation?

2005 Wisconsin Act 141 (Act 141) requires the Commission to contract with an independent auditor to prepare a performance audit of the statewide energy efficiency and renewable resource programs. Wisconsin Stat. § 196.374(3)(d) states that the purpose of this performance audit is to evaluate the programs and measure the achievement of the goals and targets established by the Commission in its quadrennial planning process. Focus on Energy's current evaluation goals were established prior to Act 141 when the Focus on Energy program was under the oversight of the Wisconsin Department of Administration. Currently, the Focus on Energy evaluation has three goals. One goal is to provide valid and reliable estimates of total program effects. These effects consist of energy savings; environmental benefits (with emphasis on quantification of displaced generation emissions); other non-energy benefits, such as increased health, safety, and comfort; and economic benefits, such as job creation and increased disposable income. A second goal of the evaluation is to provide information to improve program design, delivery, and efficiency of operations. The third goal is to document the cost-effectiveness of the programs.

Although the evaluation experts were not asked to comment on evaluation goals, several of their responses regarding the appropriate evaluation metrics provided insights into their beliefs regarding the role of evaluation. Commission staff compiled the following comprehensive list of evaluation objectives based on its experience with Focus on Energy, expert comments regarding appropriate evaluation metrics, and "The Model Energy Efficiency Program Impact Evaluation Guide" from the National Action Plan for Energy Efficiency.

1. Measure and document the energy and peak savings *attributable* to the program*
2. Measure and document environmental benefits *attributable* to the program (particularly avoided emissions)*
3. Measure and document other non-energy benefits such as health, safety, and comfort*
4. Measure and document economic benefits (such as job creation)*
5. Determine whether statutory goals have been achieved
6. Provide data needed to assess the cost-effectiveness of the programs*
7. Provide on-going feedback and guidance to the program administrator*
8. Inform decisions regarding program administrator compensation and final payments
9. Inform decisions regarding resource planning
10. Inform decisions regarding the appropriate energy efficiency and renewable resource goals and budgets

*Current established stated objectives of the Focus on Energy evaluation.

Commission Alternatives

Commission staff initially identified two alternatives for the Commission to consider. Alternative One would be to continue using the three Focus on Energy evaluation goals because they are broad enough to cover all 10 of the more specific goals named above. Alternative Two would be to individually choose, from the above list of objectives, the evaluation goals that the Commission determines appropriate.

ICG, JPI, and WUA all recommend Alternative One. WECC indicated that many of the goals in Alternative Two are appropriate, with goal 1. being the most important and goals 5., 6., and 7. also having high priority. Although ICG recommended Alternative One, it also listed information that it would like to be made available, such as measured energy and peak savings for each program. All of the information listed by IGC is currently available in various Focus on Energy evaluation reports. JPI states that although the goals in Alternative One may be an appropriate starting point, evaluation issues and goals require further analysis and attention over time. JPI recommends the Commission establish an Evaluation Working Group composed of evaluators and interested parties such as utilities, customer and environmental groups, Focus on Energy staff, and Commission staff. The Evaluation Working Group would cooperatively address evaluation issues, such as the need for precision versus cost to obtain evaluation objectives, and provide suggestions for changes. WUA suggests the development of an evaluation, measurement, and verification framework and protocols. This could also be addressed by the Evaluation Working Group. Based on these comments, Commission staff added Alternative Three, which includes the establishment of a Evaluation Working Group.

Alternative One: Status quo. The appropriate evaluation goals are to: (1) measure and document the effects attributable to the program, (2) provide data needed to assess cost-effectiveness, and (3) provide on-going feedback and guidance to the program administrator regarding program design, delivery, and efficiency of operations.

Alternative Two: Choose the appropriate evaluation goals from the following:

1. Measure and document the energy and peak savings attributable to the program
2. Measure and document environmental benefits (particularly avoided emissions)
3. Measure and document other non-energy benefits such as health, safety, and comfort
4. Measure and document economic benefits (such as job creation)

5. Determine whether statutory goals have been achieved
6. Provide data needed to assess cost-effectiveness
7. Provide on-going feedback and guidance to the program administrator
8. Inform decisions regarding program administrator compensation and final payments
9. Inform decisions regarding resource planning
10. Inform decisions regarding the appropriate energy efficiency and renewable resource goals and budgets

Alternative Three: Retain the existing three Focus on Energy evaluation goals, but also establish an Evaluation Working Group comprised of evaluators and other interested parties to address evaluation issues over time.

II. What are the appropriate evaluation metrics?

In order to assist Commission staff in formulating alternatives for the Commission to consider concerning the appropriate standards for program evaluation, Commission staff gathered input from evaluation experts from around the country. On October 30, 2009, Commission staff requested input from the experts on the following program evaluation issues: savings metrics; attribution; life cycle savings; cost-effectiveness tests for energy efficiency; and renewable energy benefit-cost analyses. Ten sets of comments were received from nine organizations. Comments were received from the following: Mimi Goldberg, KEMA; Fred Gordon, Energy Trust of Oregon; Nick Hall, TecMarket Works; M. Sami Khawaja, Cadmus Group; Rick Morgan, Morgan Marketing Partners; Monica Nevius, Consortium for Energy Efficiency; Jane Peters, Research into Action; Ralph Prahl, Prahl and Associates; and David Sumi and Bryan Ward, PA Consulting Group (two sets of comments).

Before launching into any details about evaluation metrics, it may be helpful to provide a basic outline and framework for considering the core questions that the Commission must address. All of the evaluation issues before the Commission can be organized as follows:

A) How should energy "savings" be quantified?

1) Should the Commission use "gross savings" or "net savings" as the basis for setting goals and evaluating contract performance?

2) If the Commission chooses to use "net savings," what attribution methods should be used to convert gross savings into net savings?

3) Should the Commission use "first year savings" or "life-cycle savings" as the basis for setting goals and evaluating contract performance?

4) If the Commission chooses to use "life-cycle savings," what assumptions should be used to estimate future savings?

B) Which cost-effectiveness tests are the most appropriate in the context of program approval, contract achievement, and societal benefits?

C) How should the monetary costs and benefits associated with energy efficiency and renewable resources be quantified?

1) How should avoided energy costs be calculated?

2) What discount rate should be used for future year costs and benefits?

3) What monetary value should be assigned to greenhouse gas reductions?

4) Should the cost-effectiveness of renewable resources be measured in the same manner as the cost-effectiveness of energy efficiency?

The remainder of this memorandum discusses each of the above issues in more detail.

A) How should energy "savings" be quantified?

1) Savings metrics

The evaluation experts identified a number of metrics that can be used to establish goals and measure program savings. These include gross savings, net savings, and net savings based on pre-determined attribution factors. Gross savings are the savings resulting directly from program related actions taken by participants in the energy efficiency or renewable energy program, regardless of whether the action would have been taken in absence of the program. Net savings are the savings that are directly attributable to the program. In Wisconsin, adjustments to the gross savings for both free riders and free drivers are used to arrive at the net savings. Free riders are participants in the program who would have installed the energy efficiency or renewable resource measure even in the absence of the program. Free riders are a negative

adjustment to gross savings as they reduce program attribution. Free drivers are non-participants who adopt a measure as a result of the influence of an evaluated program. This change in the behavior of non-participants that is caused by the program is sometimes called spillover or market effects. Market effects result in a positive adjustment to gross savings. Currently Wisconsin uses gross savings to publicly report the outcome of the energy efficiency and renewable resource programs. However, because net savings reflect the true impact of the programs, net savings are used for contractor performance measurement and also to evaluate the cost-effectiveness of the programs.

The evaluation experts were asked to comment on the appropriate savings metrics to be used in various contexts. There was consensus among the experts in two related areas. All of the experts indicated a need to use net savings to inform continual improvement of program design and to evaluate cost-effectiveness for the purpose of determining whether a program should continue to be offered. There was also general agreement, with the exception of one expert, that net savings should be used to make public policy decisions and to document greenhouse gas emission reductions. The experts emphasized the importance of measuring net savings to ensure that ratepayer dollars are being spent on energy efficiency and renewable resource programs that result in a ratepayers' benefit that would not have occurred without the expenditure.

The greatest disagreement among the experts was the appropriate metrics to use in the context of administrator contract and utility program goals. Ms. Goldberg, Mr. Hall, Mr. Morgan, and Mr. Khawaja recommend that these goals be set on a gross basis. They argue that net savings are inherently difficult to measure. Mr. Hall states that, much of the time, evaluation studies only produce *estimates* of net impacts that must be accompanied by numerous

caveats. Mr. Morgan indicates that when net goals are established in program administrator contracts, there are too many variables outside the program administrator's control and influence to adequately plan to meet the contract goals.

A recent example can illustrate this point. A draft of "Results of the Multistate CFL Modeling Effort" conducted by the Focus on Energy evaluation contractor was used both to arrive at the net savings for calendar year 2009 and to establish contract goals for 2010. There have been three versions of this report. The first version suggested a net-to-gross (NTG) ratio (also referred to as attribution factor) of 1.11 for residential compact fluorescent light bulbs (CFLs) while the second suggested a NTG ratio of 1.45. In light of this report, and to be conservative, a NTG ratio of 0.8 for CFLs was assumed when establishing Focus on Energy residential kWh goals for the 2010 contract year. Subsequent to approval of the 2010 Focus on Energy contract, the final version of the report recommends Focus on Energy use a NTG ratio of 0.62 for residential CFLs. CFL savings are a large portion of the residential program. With so much uncertainty regarding the residential CFL attribution factor to be applied to the gross CFL savings in 2010, the residential program administrator will need to achieve a higher level of gross savings than anticipated when the 2010 contract net goals were developed in order to ensure the net savings goals in the contract are met.

The evaluation experts recommending gross savings for contract goals indicate that there are means, other than establishing net goals in the contract, to ensure that the programs achieve savings that would not have occurred in their absence. One suggestion is to accomplish this through an annual program review of NTG ratios. If the annual program review provides evidence of a low NTG ratio, the program administrator could be required to modify a program, or the portfolio of programs, to increase program attribution. Another suggestion is to use

program attribution as a management performance tool. The evaluators would continue to determine NTG ratios for the programs. The program administrator could then be rewarded for high attribution and penalized for low attribution. These suggestions likely reduce the risk to the program administrator for goal achievement. However, they still require the measurement of net savings. Also, using program attribution to reward or penalize the program administrator would still result in the administrator compensation being tied to uncertain net savings.

The experts recommending the use of net savings for contract goals, Mr. Prahl and Mr. Ward, agree that there are challenges to measuring net savings and that these challenges are increasing. However, they indicate that it is still important for contract goals to incorporate net savings for several reasons. One reason is the need to directly measure what is being pursued by the programs, which for Focus on Energy has been savings that would not be achieved without the programs, or net savings. These experts also believe net contract goals are the most appropriate method to encourage program administrators to pursue savings that would not occur in the absence of the programs. Mr. Prahl further indicates that if providing program administrators an incentive is the most important reason for measuring net savings, then we only need to measure net savings precisely enough to send the right signals to the program administrators to steer the programs in the right direction, instead of the greater level of precision Focus on Energy evaluators are currently striving for. Mr. Prahl offers suggestions to change the current Focus on Energy evaluation approach taken to measure net savings to address concerns about the use of net savings as the contract goal.

Although Ms. Goldberg recommends the use of gross savings for contract goals, she offers that if the Commission determines that net savings goals are more appropriate, the basis for the net goals should be simple, transparent, and defined as part of the contract. Ms. Goldberg

suggests two approaches that may be workable. The first is to set pre-determined NTG ratios based on prior evaluation work that would be applied to the contract period. Any new evaluation findings would be used to update NTG ratios. The updated NTG ratios would then be applied only in future contract periods. A second approach would be to use a standard survey and analysis process, with all parties agreeing to use the results to quantify contract year achievement against goals. Both of these suggestions would reduce risk to the program administrator.

Commission Alternatives

Commission staff developed four options for the Commission to consider. As there was generally agreement on the use of net savings to determine cost-effectiveness, to inform continual program development, and for public policy decision making, this is a common element in all of the alternatives. Alternatives One, Two, and Three all use net savings not only for the above-stated purposes, but also for establishing contract goals. Alternative One would require no changes in the current evaluation approach to measuring net goal achievement. Alternative Two would result in a change in the level of precision required by the evaluators in determining program attribution. Alternative Three would modify the current evaluation approach to use pre-established levels of attribution, or results of a standard survey and analysis process, to quantify the current year's attribution. Both Alternatiaves Two and Three would result in less risk to the program administrator resulting from the uncertainty of the level of attribution assigned to the gross savings. Alternative Four, which establishes gross contract goals, is appropriate if the Commission determines that because of the challenges in estimating net savings, it is not reasonable to hold program administrators accountable for achieving net goals.

JPI, WECC, and WUA all recommend the use of gross savings in the context of contract goals. This is Alternative Four. All cite the difficulty and uncertainties regarding the measurement of net savings as a reason to base contracts of gross savings goals. JPI further states that although NTG ratios have limited usefulness as a means of compensating a program administrator, they can be used as a performance management tool to send the right signals to a program administrator to move the programs in the right direction. JPI recommends Alternative Two, with the addition of a stakeholder vetting of protocols and methods to change the level of precision used to measure attribution. Commission staff has included this suggestion as an optional addition to Alternative Two. The Evaluation Working Group could conduct this vetting.

Alternative One: Status quo. Net savings are appropriate for use in all contexts.

Alternative Two: Net savings are appropriate for use in all contexts. Protocol should be developed to modify the current evaluation approach, when warranted, to match the level of precision in the evaluation to that needed to guide the programs in achieving an appropriate level of attribution. *Optional addition: It is appropriate for the Evaluation Working Group, or some other stakeholder group, to address the protocols and methods used to change the level of precision used to measure attribution.*

Alternative Three: Net savings are appropriate for use in all contexts. Either NTG ratios that have been previously set and are written into the contract, or the results of a standard survey and analysis process, should be used to quantify the current year's contract achievement.

Alternative Four: Net savings are appropriate in determining cost-effectiveness, to inform continual improvement of program design, and for public policy decision making. Gross metrics are appropriate in the context of contract goals.

2) **Ways to Measure Attribution or Net Energy Savings**

Not all states measure or report net savings. For those that do, the means of estimating program attribution vary. As discussed previously, gross savings estimates can be adjusted for free riders and market effects to arrive at net savings. In some states program attribution is estimated to be 100 percent because there is an assumption that market effects are about equal to free riders. Other states only include estimates of free riders in determining net savings. The evaluation experts identified several program attribution evaluation methods. They also discuss the appropriate use of these methods as well as the advantages and disadvantages of each method.

Currently the choice of the attribution measurement method for Focus on Energy programs is based on the March 16, 2006, white paper, Net-to-Gross Method Selection Framework for Evaluating Focus on Energy Programs, developed by the Focus on Energy evaluation team. This paper describes a process for deciding whether the use of self-reported program response or market sales data is the most appropriate attribution measurement method. Each of these methods is examined more closely below.

Self-Reported Program Response Data

The self-report method of estimating program attribution relies on responses to survey questions by asking what an individual would have done in the absence of program support. Self-reports may be performed on program participants, non-participants, or supply-side actors such as contractors and other market providers. In Wisconsin, self-reports have typically been limited to program participants, though increasingly supply-side actors are also surveyed.

There are various advantages and disadvantages to using self-report surveys to measure attribution. Ms. Peters believes that self-report surveys perform fairly well when you want program participants to report on facts that can easily be corroborated. For example, to

determine the efficiency level of a refrigerator, you might ask a participant to open their refrigerator door and read the model number over the phone. However, many experts providing comments noted several disadvantages to using self-report surveys when trying to ascertain what an individual would have done in the absence of the program. Self-reports may contain many different biases that are difficult to control in a battery of survey questions. First, participants who take the survey have self-selected to participate, indicating that they already have an interest in the subject matter. Participants may also give survey answers that they perceive to be the most socially acceptable. Answers are also subject to a participant reliably recalling why he or she made a particular decision in the past.

Ms. Peters noted that if self-report surveys are to be used, evaluators must survey participants as close to their decision as possible, using the best bias-reducing sequence of survey questions as possible. She stated that initial work with the Energy Trust of Oregon suggests that free rider rates measured closer to the decision are different than those measured one or two years later. She believes that use of the self-report method of determining attribution requires evaluators to be engaged during the implementation process, to be given access to participation data bases on a regular basis to pull samples, and to create a very clear set of questions and algorithms for addressing free riders.

An additional hurdle to the use of the self-report method to estimate program attribution is introduced if a major component of the program is to work with energy efficiency supply-side market actors such as manufacturers, retailers, or contractors. Program participants that are influenced by these supply-side actors may not be fully aware of the program's impact on them. In cases where there is significant supply-side activity, such as for the Focus on Energy programs, Ms. Goldberg believes that surveys of supply-side actors should take place in

conjunction with basic participant surveys, if there is strong indication that the effects of these supply-side actors are likely to be measurable.

Several experts state that the use of participant self-reports to estimate program attribution might be strengthened by also interviewing non-participants to see why they made a particular decision or not. If there are significant differences in what a participant did versus a non-participant, this may indicate that a program is having a positive influence over a participant's decision. A disadvantage of the use of non-participant surveys in conjunction with participant surveys is the additional cost.

Using a self-report method is also complicated when there are multiple programs and influences in the market. Possible customer influences, in addition to Focus on Energy programs, include utility energy efficiency and renewable energy programs, federal grants, and tax credits. Multiple market influences are common today. A participant typically cannot always discern one influence from another, and many times it may be that the entire collection of influences brought the person to making a certain decision, rather than just one specific influence. Mr. Prahl believes that in an environment of multiple influences, self-reporting methods can still typically quantify the attribution for all influences bearing on a particular market jointly, but can sometimes only qualitatively assess the contribution made by each individual program. Assigning a level of attribution to each of the programs for purposes of reporting net savings under these circumstances can be problematic.

A reliable self-report method of estimating program attribution requires the development of a clear set of questions and algorithms for addressing program attribution. The results of the self-report method are subject to a high level of variability based on the set of questions and algorithms used. Review of self-report evaluations conducted in other states indicates a wide

application of the self-report method. At one end of the spectrum is Energy Trust of Oregon's application of the self-report method. The Energy Trust of Oregon asks questions regarding what stage the project was in when the decision was made to participate in the program. The algorithm then assigns 100 percent attribution to any project in which the equipment was not already ordered. The Energy Trust of Oregon's application of the self-report method results in high attribution. In contrast, Focus on Energy self-report surveys ask a series of questions in a number of different ways within the same survey. The purpose of a series of questions is to test the validity of the respondent's answers regarding the likely influence the Focus on Energy program had on the efficiency of the equipment installed, the timing of the installation, and, for measures with multiple units such as lighting, the program's influence on the number of units installed. Focus on Energy does not receive 100 percent attribution unless *all* of the respondent's answers indicate that the program influenced the efficiency level and the equipment would not have been installed until at least four years in the future. This can be a difficult hurdle.[2] If the Commission determines that self-reporting is an appropriate method for estimating attribution of energy efficiency and renewable resource programs, it may wish to consider requiring a review of the range of questions and algorithms used nationally in self-report surveys. Changes to the Focus on Energy self-report method could then be made to bring it more in line with other states while still requiring an appropriate level of rigor.

Sales Data or Other Market Intelligence

Sales data or other market intelligence can also be used to determine a program's influence on a particular market. Although this approach has not been used frequently in

[2] JPI, in their comments on the appropriate level of goals and budgets, states that continued use of the current Focus on Energy self-report battery of questions, algorithms, and assumptions would require an increase in the budget needed to achieve its recommended level of goals.

Wisconsin, it has been used in some cases, such as the Focus on Energy CFL and high-efficiency furnace programs, to assist in determining program attribution.

The main advantage to using sales data or other market intelligence to determine a program's attribution is that it reflects customers' actual decisions, rather than relying on participants' reported behaviors. Using sales data as a means for determining attribution can be especially useful when the program is working primarily with supply-side actors, such as manufacturers or distributors of energy efficient or renewable resource equipment.

However, Ms. Goldberg and Mr. Prahl both remarked that use of sales data or other market intelligence to estimate a program's attribution must have a defensible means of determining the baseline of what would have occurred over the program period in the absence of the program. Both noted that setting the baseline has become increasingly problematic, as appropriate comparison states with no programs are essentially nonexistent now. Additionally, they noted that gaining access to relevant sales data can be difficult.

The 2009 "Energy Efficiency and Customer-Sited Renewable Resource Potential in Wisconsin" study conducted by the Energy Center of Wisconsin also discusses evaluation approaches to estimating program attribution. The Potential Study states that the current evaluation approaches used in Wisconsin, mainly self-reports, have the tendency to understate the true influence of the program. The Study indicates that changes to the way Wisconsin evaluates programs, particularly aggressive and innovative programs, will be needed if the energy efficiency potential identified in the study is to be reached. The Potential Study recommends that the Commission convene a work group to assess current evaluation methods, with the goal of developing a total market-based means of determining program attribution.

Triangulating Results of Multiple Methods

Several of the experts indicate that it can be appropriate to use the results from multiple methods to estimate program attribution, as no one method is perfect. Mr. Gordon noted that in Oregon, often both participant and non-participant self-reports are obtained from customers and contractors, and if affordable, market share data in non-participating service territories is also looked at. He noted that Oregon dedicates more dollars to this type of triangulation when evaluating large savings measures, and less for measures with smaller savings.

Ms. Goldberg and other experts noted that using multiple methods of estimating program attribution can provide more insight and information, and greater confidence in results if the results support one another. However, the results are sometimes inconsistent. When this occurs, Ms. Goldberg suggests a range of results could be presented by evaluators, identifying likely biases or weaknesses affecting each method, and indicating what results they think are the most valid and why.

Several of the experts noted that with limited resources it may not always be feasible to use multiple methods to estimate program attribution, all in a comprehensive and meaningful way. It may be necessary to make the choice to invest resources in a single method that best fits a particular market.

Commission Alternatives

Commission staff developed three alternatives for the Commission to consider. The first alternative would result in no changes to current evaluation practices. Alternative Two would continue to rely on the existing evaluation guidelines to select the appropriate attribution methods but would require a review of how the attribution methods chosen through the use of the framework are applied. Alternative Two is appropriate if the Commission has no concerns about how the methods of determining attribution are chosen but believes there is sufficient evidence

that the application of these methods in Wisconsin presents a higher hurdle for determining attribution than is the norm in other states, and that a review and potential modification of the application of the methods is therefore warranted. Alternative Three is appropriate if the Commission determines, because of the importance of the attribution methods and their applications in estimating net savings, it is appropriate not only to review the application of the methods used but also to review the guidelines to be applied in choosing the methods.

ICG, JPI, WECC, and WUA all recommend Alternative Three, establishment of a work group to address this issue. JPI indicates the broader Evaluation Working Group that it proposed could also serve this purpose. The Evaluation Working Group would review the specific evaluation objectives and develop guidelines for selecting the appropriate attribution measurement methods. WECC states that the work group should play an active and on-going role in reviewing evaluation plans to ensure they meet the intent of the evaluation framework.

Although Tom Wilson did not specifically comment on the appropriate attribution measurement methods, he commented on how energy savings are to be measured, such as engineering calculations, rules of thumb, and billing analysis. Although it is beyond the scope of this docket to determine how to measure the energy savings of individual programs, it may be appropriate for a work group to address this issue. Commission staff modified Alternative Three to include this as an additional option.

Alternative One: Status quo. It is appropriate to continue to use the Net-to-Gross Method Selection Framework for Evaluating Focus on Energy Programs to select the appropriate attribution measurement method(s). No changes to the current application of the self-report and market data methods are needed.

Alternative Two: It is appropriate to continue to use the Net-to-Gross Method Selection Framework for Evaluating Focus on Energy Programs to select the appropriate attribution measurement method(s). A work group shall be established to review the current application of the self-report and market data methods used in other states and recommend changes to be implemented that bring Wisconsin more in line with other states.

Alternative Three: A work group shall be established to develop new guidelines for selecting the appropriate attribution measurement method(s). This work group should also review the current application of the self-report and market data methods being used in other states and recommend changes to be implemented to bring Wisconsin in line with other states. *Optional addition one: This work group shall also review evaluation plans to ensure that they meet the new evaluation framework. Optional addition two: This work group shall also review the methods used to measure the savings of the programs and recommend changes.*

3) **Life- Cycle or First Year Savings**

First year savings are one year's worth of savings from the energy efficiency and renewable resource measures installed during the program year. However, most measures last for more than one year. The savings over the lifetime of a measure are calculated by multiplying the first year savings by the number of years the measure is expected to be in operation. These are called life-cycle savings. Currently, Focus on Energy program goals are based on first year savings and it is first year savings that are publicly reported. Other states also publicly report first year savings. However, Focus on Energy evaluators also account for life-cycle savings in their reporting of program achievement. These life-cycle savings are used by Focus on Energy evaluators when estimating the program's cost-effectiveness. In his comments, Mr. Gordon noted that Wisconsin's approach is comparable to how the Energy Trust of Oregon operationally treats first year and life-cycle savings. He stated that annual savings goals are the most

convenient and clear way to express goals, while life-cycle savings determine total value of the program.

Several of the experts recommend the establishment of life-cycle savings for goals. Ms. Goldberg and Mr. Prahl indicate that life-cycle goals reduce any distortion in the value of the savings and the programs caused by the varying lifetimes of the measures. A comparison of two measures with the same first year savings but different lifetimes can illustrate this point. Assume both measures have first year savings of 500 kWh. However, one measure has a lifetime of one year and the other has a lifetime of ten years. With first year savings goals, both measures would be valued the same at 500 kWh. However, under life-cycle goals, the value of the measure with a life of ten years would be 5,000 kWh while the value of the measure with a one year life would only be 500 kWh. With first year goals, the program administrator is indifferent to which of the two measures is installed. However, with life-cycle goals, the program administrator has an incentive to capture savings from longer lived measures. Mr. Hall states that a policy of sustainable energy supply and reduced greenhouse gas emissions renders annual savings goals irrelevant. The experts also comment that because of uncertainties around measure life, acceleration, and degradation (*see Section II.A.4 for a discussion of these assumptions*), if life-cycle goals are set it should be made clear what assumptions and methods will be used for these parameters when measuring achievement of the goals.

Commission Alternatives

Measures with short lives tend to be some of the most cost-effective measures and therefore are often targeted by energy efficiency programs. A decision to move from first year goals to life-cycle goals would send a signal to those who administer energy efficiency programs that the programs should target measures that continue to provide savings over a long period of

time. The Commission may also consider that the goals included in the Governor's Global Warming Task Force recommendations are based on first year savings. If the Commission determines that it is appropriate to set life-cycle savings goals, it is likely that first year savings will also need to be publicly reported, as first year savings are more easily understood by the public and are most often used to compare program achievement across states. Because first year savings are necessary to estimate life-cycle savings, this information will be readily available.

Both ICG and WUA state that, since Wisconsin does not have long-term carbon reduction goals, it is appropriate to establish goals on a first year savings basis. JPI and WECC recommend the establishment of life-cycle savings goals. Both state that life-cycle savings goals appropriately emphasize program planning that will achieve the greatest level of savings over time. JPI also states that use of life-cycle savings is consistent with the Commission's decision in Phase 1 to establish a planning and implementation period of four years.

Alternative One: Status quo. Continue to establish first year annual goals for energy efficiency and renewable resource programs. Life-cycle savings are to be documented and used to evaluate program cost-effectiveness.

Alternative Two: Establish life-cycle savings goals for energy efficiency and renewable resource goals. First year savings shall be made available for public reporting purposes.

4) **Measure Life, Degradation, and Acceleration**

In order to document life-cycle savings, assumptions must be made regarding the lives of the measures. Life-cycle savings can also incorporate a degradation of savings over time and the impact of the program on accelerating the energy efficiency savings. Incorporating these effects requires that additional assumptions be made.

Focus on Energy evaluators currently document life-cycle savings by using a weighted effective useful life (EUL) for measures' lives and an adjustment for the degradation of savings over time. Acceleration of savings is not yet incorporated into the Focus on Energy life-cycle savings. EUL is an estimate of the median number of years that the energy efficiency measures installed under a program are still in place and operable. While several experts noted that life-cycle savings provide a more balanced view of what the program is achieving over time, they also note that savings reported on a life-cycle basis are more uncertain than first year savings. Both Mr. Hall and Ms. Goldberg remark that a measure's life cannot be known with a high degree of accuracy. Some measures may have an assumed EUL of a certain number of years, but in reality the measure is maintained for much longer. In other cases, the measure's actual life may be much shorter than its assumed EUL because of equipment failure.

Incorporation of savings degradation adds additional uncertainty to life-cycle savings estimates. Energy savings degrade each year of a measure's EUL. Savings can degrade for any number of reasons, such as the equipment not being used properly, lack of maintenance, or closing of a business. To take into account savings degradation over time, current Focus on Energy evaluators apply decay curves to life-cycle savings. These decay curves are based on the EUL and an assumed measure survival curve shape. Life-cycle savings to which a decay curve has been applied are called persistent life-cycle savings. Ms. Goldberg noted that this approach means that a small fraction of installed measures are assumed to fail early, while some continue to operate well past the EUL. Several experts provided similar comments, noting that the shape and slope of the degradation curve are uncertain. Mr. Prahl also stated that there is not very good, recent research available regarding measure lifetimes or degradation over time. However,

he notes that even in the absence of accurate data, estimating degradation based on theoretical expectations and estimated EULs may still be more accurate than simply ignoring the issue.

Another factor that can have a significant impact on life-cycle savings occurs when a program is successful in getting participants to purchase energy efficient equipment before their existing equipment fails. This results in higher savings in the early years of the equipment life which then drops to a lower level when the equipment was expected to be replaced.[3] The savings from the early years are termed accelerated savings because they result from the program influencing a customer to implement a measure earlier than he or she would have in the absence of the program. For example, if a customer tells evaluators that in the absence of the program, he or she would have waited two more years to purchase a high efficiency furnace, the evaluators might credit the program with two years of accelerated savings. Acceleration of savings has not yet been incorporated into savings estimates by Focus on Energy evaluators. However, it is anticipated that future measurement approaches will allow for the estimation of accelerated savings.

Commission Alternatives

An estimate of measure life is needed to report life-cycle savings. There is agreement that EULs are appropriate to use for measure lives. Life-cycle savings can be adjusted to reflect savings degradation and accelerated savings. There appears to be general agreement that degradation and acceleration are important for evaluating the cost-effectiveness of programs. There also appears to be agreement that there is considerable uncertainty regarding these two variables used in estimating persistent life-cycle savings. Because of the uncertainty regarding degradation and life-cycle savings, if the Commission determines that life-cycle savings goals

[3] This is because the baseline for determining the savings for the initial years is the existing equipment, while the baseline for the remaining years is the standard equipment available at the time the current equipment would have been replaced. The standard equipment available is generally more efficient than the existing equipment.

are appropriate, the Commission may wish to consider whether these variables should be incorporated in goal setting, as they would increase the uncertainty of the life-cycle savings estimates. Currently it is not known how Wisconsin's approach to estimating life-cycle savings compares to approaches used in other states.

Commission staff originally developed three alternatives for the Commission's consideration. Alternative One would continue to use the current approach to document life-cycle savings and incorporate accelerated savings when feasible. Alternative Two would require the evaluator to, in calendar year 2011, review and recommend revisions to the current approach. These first two alternatives are applicable whether the Commission determines that goals should be first year or life-cycle goals or life-cycle savings are to be used only to evaluate program cost-effectiveness. Alternative Two would rely on the evaluator's recommendations on whether or not to incorporate degradation and acceleration into the estimate of life-cycle savings, and under what circumstances. Alternative Three would also require the evaluator to review and recommend revisions to the current approach. However, Alternative Three is only appropriate if the Commission determines that life-cycle goals are appropriate.

ICG recommends Alternative One. JPI also recommends Alternative One but asks that the issue be referred to the Evaluation Working Group to consider alternative approaches. WECC recommends a modified Alternative One that eliminates the decay rates. WECC believes that the inclusion of a decay rate attempts to provide a level of precision that is unwarranted given the level of complexity and the uncertainty inherent in other measurements. Commission staff included WECC's recommendation as Alternative Four. WUA recommends review of the life-cycle savings approach in 2011 and not establishing life-cycle savings goals. WUA recommended a modification to Alternative Three to reflect its position. Commission staff did

not make this modification because Alternative Two adequately covers WUA's position. Under Alternative Two, the life-cycle savings approach would be applied consistent to the Commission's decision regarding the previous issue. If the Commission determines life-cycle savings are appropriate, then choosing Alternative Two would apply life-cycle savings to both goals and to evaluate the cost-effectiveness of programs. If the Commission determines it appropriate to establish first year savings goals, then Alternative Two would apply the life-cycle savings approach only to the evaluation of program cost-effectiveness.

Alternative One: Continue to use the current EUL and decay rate approach to document life-cycle savings. Incorporate accelerated savings when feasible. *Optional addition: This issue should be further addressed by the Evaluation Work Group or some other work group.*

Alternative Two: In calendar year 2011 require the evaluator to review and recommend revisions to the current approach to documenting life-cycle savings.

Alternative Three: In calendar year 2011 require the evaluator to review and recommend revisions to the current life-cycle approach. Degradation and accelerated savings will not be reflected in the establishment of life-cycle goals but will be used in the cost-effectiveness analysis.

Alternative Four: Use the current EUL approach, without application of a decay rate, to document life-cycle savings. Incorporate accelerated savings when feasible.

B) Which cost-effectiveness tests are the most appropriate in the context of program approval, contract achievement, and societal benefits?

The cost-effectiveness of energy efficiency and renewable resource programs can be analyzed from various perspectives. Which benefits and costs are included in the analysis depends on the perspective of the cost-effectiveness test being used. Benefits and costs that could be included in a test of cost-effectiveness include:

- Costs incurred by the participant;
- Benefits accruing to the participant;
- Utility or program administrator costs;
- Value to the utility of avoided energy costs;
- Value to the utility of avoided emissions for which active offset markets exist;
- Non-economic externalities, such as mercury emissions;
- Economic non-energy benefits and costs, such as water savings and improved productivity; and
- Non-energy, non-economic benefits and costs, such as increased or decreased satisfaction with the quality of light from a CFL.

The following types of cost-effectiveness tests have been used or suggested:

- A Participant cost-effectiveness test would only include costs incurred by the participant and benefits accrued to the participant.
- A Utility/Administrator cost-effectiveness test would only be interested in the costs incurred by the utility or program administrator to implement the programs and the benefits would be the utility's avoided costs.
- The Total Resource Cost (TRC) test takes a broader view than the Participant or Utility/Administrator cost tests by including all costs regardless of who incurs them. The costs included in this test are program costs, excluding incentives,[4] and program-attributable customer incremental costs for measure implementation. Benefits are avoided energy costs.
- Currently a modified TRC test is used to determine the cost-effectiveness of energy efficiency measures and portfolios of programs. The modified TRC includes additional benefits due to costs avoided as a result of the programs, including the value of avoided emissions for which active offset markets currently exist (SO_x, NO_x, and CO_2).
- An Expanded Net Economic Cost (Expanded) test is also currently reported at the portfolio level to provide a broader perspective. The costs included in the Expanded test are the same as in the modified TRC test, but also include non-economic[5] externalities, such as mercury, and "economic non-energy" benefits and costs, such as water savings and improved productivity.
- A Societal test could add even more externalities to the Expanded test. For example, the Expanded test does not include any non-energy, non-economic costs or benefits.

[4] Incentives are not included in these tests because they are transfer payments from those paying for the programs to program participants.

[5] "Non-economic" externalities have values set by regulatory or public policy but do not translate into flows through the economy.

The TRC and Expanded tests assess the overall costs and benefits of achieving energy efficiency savings, regardless of who pays for the benefits. All the experts commenting on this issue indicated some variation of a TRC test or Societal test, such as the Expanded test currently being used, should continue in some capacity. Most of the experts indicated that a modified TRC or Societal test is the single best measure of cost-effectiveness. Mr. Morgan states his preference to use the TRC or Societal test only as advisory at the portfolio level because neither of these tests informs program design, as discussed later.

The experts indicate that other tests would also be useful. Mr. Morgan recommends use of the Utility/Administrator Cost test for program planning purposes. The Utility/Administrator Cost test differs from the TRC test in that customer incremental costs are not included in the Utility/Administrator Cost test. The only costs included are program costs and, unlike the TRC and Societal test, these program costs include incentives. One reason given for the use of the Utility/Administrator test is that it is the only test in which all the costs that are included in the test are fully known. The incremental customer costs included in the TRC and Societal tests have not been well documented and can be highly variable from one installation to another. Ms. Goldberg indicates that use of a test that includes economic and environmental impacts and non-energy benefits, such as the Expanded test, provides a useful perspective and establishes the broader value of the programs relative to policy objectives. Ms. Goldberg also commented on the usefulness of the Participant test, which only includes costs and benefits of the participants, to help assess the acceptability of planned program offerings.

Each of the tests provides a different perspective. The Commission's previous Integrated Resource Planning process of the 1990s required that energy efficiency measures first be screened using the TRC test. Measures meeting this cost-effectiveness test were then bundled

into programs designed to meet both the Utility and Participant tests. Requiring measures to pass the TRC test can, as pointed out by Mr. Morgan, results in some measures not being included in programs that would be cost-effective from a Utility/Administrator and Participant perspective. This is because not all of the benefits of the measure are included in the TRC test. An example is high efficiency clothes washers. This measure does not pass the TRC test because the value of its energy savings alone does not justify its incremental cost. However, these clothes washers are being purchased because of their water savings, laundry soap savings, gentleness on clothes, and convenience. Although clothes washers do not pass the TRC test, a clothes washer program could, by choosing an appropriate incentive level, be designed to pass the Utility/Administrator Cost and Participant tests.

As discussed above, the use of the Utility/Administrator test, which includes incentive costs, provides insight into appropriate program design. Because incentives are not included in the TRC or Societal test, these tests cannot serve this function. Theoretically, a measure passing the TRC test could be incorporated in a program design that results in an undesirable outcome. For example, the program could provide an incentive significantly greater than the incremental cost of the measure and the program would still pass the TRC. This would result in large benefits to program participants but ratepayer costs that outweigh the benefits they receive.

Commission Alternatives

Commission staff originally developed three Alternatives for the Commission's consideration. All three alternatives require the use of a modified TRC test at both the measure and portfolio levels. Alternative One includes the continued use of the Expanded test at the portfolio level. Alternative Two would modify the Expanded test to also include non-energy, non-economic benefits to the extent feasible. Although modifying the current Expanded test

would provide a broader perspective of the benefits of the programs, the Commission may wish to consider the increased costs that would be incurred to attempt to quantify the value of non-energy, non-economic benefits. If the Commission is concerned about the costs of the program to the ratepayers, it would be reasonable to require a Utility/Administrator cost test at the program level. This would ensure that ratepayers receive benefits greater than the costs of the programs. The requirement of a Utility/Administrator test at the program level is included in Alternative Three. Currently, measures are screened using the modified TRC. Some measures that do not pass this screening are still included in programs. The decision to include them in programs is generally a judgment call based on the measure's ability to become cost-effective in the future or the measure's ability to add value to the package of measures included in the programs. Allowing the use of the Expanded test at the measure level for measures that do not pass the TRC test but have substantial non-energy benefits would include additional measures in the programs.

All three of these original Alternatives also provide the Commission the opportunity to allow the use of the Expanded test at the measure level. This additional option may be most appropriate under Alternative Three, which requires the use of the Utility/Administrator test at the program level because use of the Utility/Administrator test would ensure the program would only pay for the energy benefits related to the measure.

JPI and WECC recommend Alternative Three. including the use of the Expanded test at the measure level. Both indicate that while the TRC test is an important public policy test, it can fail to identify important cost-effective opportunities because it does not recognize valuable non-energy benefits. WUA and ICG recommend a modified Alternative One, without the use of the Expanded test at the measure level. WUA recommends modifying Alternative One to include

the Utility/Administrator and Rate Impact Measure test, stating these would be helpful for utilities designing their own programs. ICG recommends modifying Alternative One to include the Rate Impact Measure test. This test compares the utility's avoided cost benefits with the cost of energy efficiency programs plus lost revenue from the reductions in energy consumption. The National Action Plan for Energy Efficiency, however, states that none of the organizations it reviewed used this test as a primary decision-making test. Commission staff developed Alternatives Four and Five to incorporate WUA's and ICG's suggested modifications to Alternative One.

Alternative One: Status quo. It is appropriate to require that measures and program portfolios meet a modified TRC test of cost-effectiveness. It is also appropriate to continue to report the results of the Expanded test at the portfolio level. *Optional addition: Measures that do not pass the modified TRC test but have substantial non-energy benefits may be considered for program inclusion on a case-by-case basis based on the Expanded test.*

Alternative Two: A modified TRC test at the measure and portfolio levels is appropriate. It is also appropriate to report results of the Expanded test at the portfolio level. The Expanded test should be modified to include non-energy, non-economic benefits to the extent feasible. *Optional addition: Measures that do not pass the modified TRC test but have substantial non-energy benefits may be considered for program inclusion on a case-by-case basis based on the Expanded test.*

Alternative Three: A modified TRC test at the measure and portfolio levels is appropriate. It is appropriate to continue to report results of the Expanded test at the portfolio level. A Utility/Administrator test at the program level should also be conducted to inform program design. *Optional addition: Measures that do not pass the modified TRC test but have*

substantial non-energy benefits may be considered for program inclusion on a case-by-case basis based on the Expanded test.

Alternative Four: It is appropriate to require that measures and program portfolios meet a modified TRC test of cost-effectiveness. It is also appropriate to report the results of the Expanded test. The Utility/Administrator and Rate Impact Measure tests should be conducted at measure and program level to inform program design.

Alternative Five: It is appropriate to require that measures and program portfolios meet a modified TRC test and a Rate Impact Measure test of cost-effectiveness. It is also appropriate to continue to report the results of the Expanded test.

C) How should the costs and benefits associated with energy efficiency and renewable resources be quantified?

In addition to determining which cost-effectiveness test should be used in evaluating energy efficiency and renewable resource programs, assumptions must be made regarding certain valuation factors, depending on the cost-effectiveness test used. Such valuation factors include the appropriate basis for the avoided costs, the real discount rate, and the value of avoided emissions. These valuation factors are discussed below. The choice of the cost-effectiveness test used to value savings and the assumptions used for the valuation factors can have a significant impact on the level of savings potential, the cost-effectiveness of various measures and programs, and ultimately the design of the programs.

1) <u>What is the appropriate basis for avoided costs used to value the benefits of energy efficiency?</u>

Most cost-effectiveness tests, including the TRC and the Utility/Administrator test, require the value of energy and demand savings (avoided costs) as an input. The experts weighing in on the issue of how to determine the value of avoided costs generally agree that this

decision should be based on public policy objectives. Mr. Ward indicates that the current policy objective of Focus on Energy, as described in Act 141, is to reduce utility energy and demand. Under this policy objective, locational marginal pricing (LMP) is the appropriate basis for avoided costs because those are the costs the programs are trying to avoid. The Energy Center of Wisconsin's Potential Study used 2005 through 2008 LMPs from the Midwest Independent Transmission System Operator as its basis for valuing energy efficiency in the base scenario. LMPs have decreased substantially since that time due in part to new generation sources and a decrease in load. Using LMPs as the basis for avoided costs would result in avoided costs that may fluctuate substantially over the four-year planning period. Although many measures and programs would remain cost-effective across a range of avoided costs, some may be marginal with lower avoided costs. It can be difficult to maintain consistent programs from year to year in order to capture all cost-effective savings when the value of the savings is in constant flux. This is an important consideration because making substantial program changes from year to year harms a program's ability to sustain savings achievement.

Another option for valuing avoided costs was proposed by several of the experts. Act 141 includes a Renewable Portfolio Standard (RPS). The RPS reflects a public policy of a lower carbon future. Ms. Goldberg, Mr. Hall, and Mr. Khawaja all recommend basing avoided costs on the generation resources included in the RPS since energy efficiency and customer-owned renewable resources will be competing against the renewable resources of the RPS in a carbon-constrained future. Ms. Goldberg also stated that if carbon sequestration is a policy objective, the Commission could determine that sequestration costs are the appropriate basis for avoided costs.

Currently, using LMPs as the basis for avoided costs results in lower avoided costs than using the renewable resources included in the RPS. Although the Potential Study based avoided costs on LMPs, it also examined the impact of increased avoided costs on the energy efficiency potential. In a scenario in which avoided costs were increased by $0.02/kWh over the base scenario, an increase in potential of around 7 percent was identified. If program budgets are a constraining factor, it is likely that the choice of the basis for avoided costs will not have an impact on program offerings. However, currently the use of LMPs to value avoided costs would result in a lower reported value of savings of the programs and lower benefit/cost ratios than if avoided costs were based on the generation sources in the RPS.

Commission Alternatives

ICG and WUA recommend the use of LMPs to represent avoided energy costs. This is Alternative One. Because LMPs do not reflect capacity value, they also recommend an option that includes the use of the cost of a new peaking plant for capacity. ICG further suggests use of the most recent three-year historical average of LMPs to represent avoided energy costs in order to provide some stability in the avoided energy costs. Alternatives Two and Three reflect these comments.

JPI and WECC recommend basing avoided costs on the generation resources included in the RPS. This is Alternative Four. JPI states that the cost-effectiveness of energy efficiency should be assessed based on expected long-run avoided capacity and energy costs, including environmental costs such as carbon emissions. LMP prices are unlikely to represent long-run avoided costs since they are primarily affected by current market conditions and variable operating costs. JPI further states that the public policy objective of mitigating future carbon

emissions embodied in the RPS cannot be attained if existing LMPs are the basis for avoided costs.

Alternative One: Base avoided costs on LMPs.

Alternative Two: Base avoided energy costs on the most recent three-year historical average of LMPs and avoided capacity costs on the cost of a new peaking plant.

Alternative Three: Base avoided energy costs on LMPs and avoided capacity costs on the cost of a new peaking plant.

Alternative Four: Base avoided costs on the generation resources included in the RPS.

2) **What is the appropriate discount rate to use for benefit/cost modeling to ensure longer-lived measures are not undervalued?**

Currently, a discount rate of 5 percent is being used in benefit/cost modeling of Focus on Energy programs. This discount rate is based on the private cost of capital. One expert, Mr. Ward, commented that this discount rate is generally consistent with that being used in other states. A range of other discount rates was offered by the evaluation experts. Ms. Goldberg and Mr. Hall comment that the discount rate used to determine cost-effectiveness should be set consistent with public policy. Mr. Hall suggests that if short-term resource acquisition is the public policy goal, then the utility's cost of capital is adequate. The discount rate used by the state of Oregon uses the utility's cost of capital. Mr. Hall further suggests that if the policy goal is to meet the state's long-term energy needs at the least cost, including externalities, then the appropriate discount rate may approach zero or even be a negative value. This is because a zero or negative discount rate places greater value on savings that last for a longer period of time and have a greater impact on emission reductions.

Mr. Khawaja recommends the use of a "societal" discount rate for the benefit/cost analysis. Use of a societal discount rate reflects the fact that both participants and

non-participants benefit from energy efficiency programs. Mr. Khawaja suggests use of the interest rate on long-term treasury bills as a good proxy for a societal discount rate.

The Potential Study used a real discount rate of 5 percent. However, a scenario was also conducted using a real discount rate of 2 percent. A 2 percent discount rate was chosen because it continues to value the interests of current generations more than those of future ones, but does give future generations more consideration than they would have under a 5 percent discount rate. The Potential Study indicates reducing the discount rate in the analysis from 5 percent to 2 percent increased the identified potential between 5 percent and 15 percent. The Potential Study states that the use of a negative discount rate would value the interests of future generations more than current ones. This may be appropriate, as the impact of climate change will be borne by future generations.

Commission Alternatives

The Commission may wish to base its decision regarding the appropriate discount rate to use in benefit/cost modeling on the policy objective of the energy efficiency programs in Wisconsin. If the objective is short-term resource acquisition, Alternative One is the most appropriate choice. Alternative One continues the current practice of using a 5 percent discount rate. If the policy objectives of the programs are sustainable energy supply and reduced greenhouse gas emissions, then the appropriate choice would be the lower discount rates described in Alternatives Two, Three, and Four, depending on how much the Commission wishes to value the interests of future generations compared to current ones.

JPI recommends the Commission adopt a real discount rate in the range of 0 to 2 percent. JPI states that this range represents a reasonable range to achieve the public policy objectives of achieving a least cost, sustainable energy resource system. This range reflects that energy

efficiency is a low-risk societal investment comparable to the return on a money market fund rather than the return on risky investments such as corporate stocks. WECC recommends Alternative Two, stating that the lower discount rate of 2 percent provides a better balance between the short- and long-term societal benefits provided by energy efficiency programs.

ICG and WUA recommend use of the same discount rate to evaluate energy efficiency initiatives as is used to evaluate investments in supply side resources since the discount rate is supposed to reflect the time value of money. While WUA recommends Alternative One, ICG does not believe this alternative adequately captures its recommendation. Alternative Five reflects ICG's recommendation that the discount rate be the utility's cost of capital.

Alternative One: Continue using a discount rate of 5 percent for benefit/cost modeling of energy efficiency programs.

Alternative Two: Use a discount rate of 2 percent for benefit/cost modeling of energy efficiency programs.

Alternative Three: Use a discount rate of 0 percent for benefit/cost modeling of energy efficiency programs.

Alternative Four: Choose some other discount rate for benefit/cost modeling of energy efficiency programs.

Alternative Five: Use a discount rate equal to the utility's cost of capital for benefit/cost modeling of energy efficiency programs.

3) **How should carbon be valued over time?**

Few of the experts provided recommendations on how carbon should be valued in the benefit/cost modeling. Mr. Hall, in a paper he co-authored and submitted as part of his

comments in this docket,[6] suggests the values of carbon and other externalities should not be market-based. The implied policy of this paper is one of sustainable energy supply and reduced emissions. The paper recommends valuing carbon based on the cost of mitigating climate change. Ms. Goldberg and Mr. Sumi both indicate that policy objectives should determine the basis for carbon valuation. Mr. Sumi further states that the choice of the value of carbon should reflect a hedge against future risk. Mr. Khawaja recommends that the value of carbon be based on utility system planning and that carbon avoided costs should be assumed to already be imbedded in utility avoided costs. The Potential study valued carbon at $30 per ton of carbon dioxide emitted.

There is no consensus among the evaluation experts solicited, nor nationally, regarding the appropriate carbon value. Nationwide, values of carbon dioxide used by utilities range from $0-62 per ton. In the northeast, permits are selling for $20 per ton. The Environmental Protection Agency's analysis of the Waxman-Markey bill suggested allowance prices of $13-17 per ton in 2015. The Commission's policy objectives should drive its decision regarding the carbon value to be used in energy efficiency benefit/cost analyses. If the Commission's policy objective for the four-year planning horizon is least-cost short-term resource acquisition, then a market-based value of carbon would be appropriate. This market-based value could be zero if the Commission is not willing to forecast the future market value of carbon. If the Commission determines that a market-based value of carbon should include the potential future market value of carbon, a value in the $20 range may be appropriate. If the Commission's long-term policy objective is a sustainable energy supply with reduced emissions, then a value at the high end of the range, such as $50-60 per ton, may be appropriate. A value in the middle of the

[6] Reaching Our Energy Efficiency Potential and Our Greenhouse Gas Objectives: Are Changes to Our Policies and Cost-Effectiveness Tests Needed?

range, such as the $30 per ton figure that is used in the Potential Study, could be chosen to reflect higher expected market costs of carbon in the future or a more conservative policy regarding the need for emission reductions.

Commission Alternatives

Commission staff developed four Alternatives for the Commission to consider. ICG recommends Alternative One at this time, which places zero value on carbon. WUA recommends Alternative Two because it reflects the current value of carbon in an existing market ($20 per ton). JPI and WECC both recommend Alternative Three, $30 per ton. WECC indicates a carbon value of $30 per ton is a reasonable starting point for the inclusion of carbon over the planning period. Also, because of carbon value of $30 per ton was used in the Potential Study, using this value for cost-effectiveness assessment would ensure consistency between the potential identified in the Potential Study and the assessment of programs designed to achieve that potential. JPI states that the value for carbon should be based on two factors: (1) a range of proxy values for carbon emission reductions in existing carbon regulated markets and from values derived from proposed national legislation and (2) a value that reflects energy efficiency's value as a hedge or insurance against the future risk and uncertainty from climate change. JPI believes Alternative Three best satisfies these two factors. JPI further states that should there be a carbon reduction mandate in the future, at that time the value of carbon should be market based. Alternative Four sets the price of carbon high enough ($60 per ton) to promote a long-term, sustainable energy supply with reduced carbon emissions.

Alternative One: Carbon should be valued at zero.

Alternative Two: The value of carbon should be market based. It is appropriate to use a carbon value of $20 per ton to reflect the likely future costs of carbon regulation.

Alternative Three: A carbon value of $30 per ton strikes the appropriate balance between the market value of carbon and reflecting the need for emission reductions.

Alternative Four: The value of carbon should be based on a sustainable energy supply with reduced emissions. An appropriate carbon value is $60 per ton.

4) **Evaluating the cost-effectiveness of renewable resources**

Focus on Energy determines the cost-effectiveness of renewable resources in the same manner as for energy efficiency. However, comments in Phase 1 of this quadrennial planning process indicate that use of the TRC test may not be appropriate for evaluating the cost-effectiveness of renewable resources. Under the TRC test, several renewable resources have been determined to be not cost-effective. The Potential Study used the TRC in its base scenario to determine the cost-effectiveness of various renewable energy technologies. However, the Study also included an aggressive scenario that includes additional renewable resources, which are not cost-effective under the TRC test. Appendix A of the Renewable Energy section of the Potential Study presents an argument for valuing renewable resources differently than energy efficiency. It states that while the environmental and economic development benefits of renewable resources can be reflected in the TRC test, the TRC test cannot take into account two key components of renewable resources: increased energy security and the expanded opportunity to transition Wisconsin to a new energy economy. Further, renewable resources are largely undeveloped. The report states that for an undeveloped resource, any test that does not reflect the "option value," a measure of the flexibility of a resource, undervalues the resource. "Option value" accrues from having the ability to use more of a resource, if conditions warrant.

Several of the experts commenting on this issue recommend that the cost-effectiveness of renewable energy programs be measured in the same way as energy efficiency programs.

Mr. Sumi further states that public policy can then determine whether renewable energy programs should continue to be included in an overall portfolio of programs that provide net benefits. Ms. Goldberg recommends the use of an explicit value for renewable energy programs, such as a high social externality value, in the cost-effectiveness tests for renewable resources. Mr. Ward recommends a similar treatment, the use of avoided costs that reflect an additional value based on the overall policy objectives of renewable resource programs. Mr. Gordon indicates the Energy Trust of Oregon uses an "above-market cost test" to identify which renewable resources need additional market development assistance. In this "above-market cost test," renewable resources are not subject to an economic test *per se*, but are compared within the renewable market and between markets to determine fund allocation based on public policy and program strategy.

Commission Alternatives

The Commission has several options regarding the cost-effectiveness evaluation of renewable resource programs. Alternative One is appropriate if the Commission determines that renewable resources should be valued in the same manner as energy efficiency measures. If the Commission believes that there are benefits exclusive to renewable resources that will not be adequately reflected in the cost-effectiveness tests determined to be appropriate by the Commission in Section I.B. above for energy efficiency measures and programs, the Commission has several options. Alternative Two would require the use of an Expanded test that includes non-energy benefits that the Commission considers to be exclusive to renewable resources, such as increased security and the flexibility, or option value, of the resource. Alternative Two would require the development of an options value component, which is, according to the Potential Study, a complex undertaking. Alternative Three would reduce the

cost-effectiveness threshold that renewable resources must meet from 1.0 to a lower number. The Potential Study used a threshold of 0.75 in its aggressive scenario for renewable resources. The difficulty with Alternative Three is that there is currently no information available that would serve as the basis for the appropriate threshold level. Alternative Four would determine that it is reasonable to evaluate the cost-effectiveness of renewable resources in the same manner as energy efficiency and then rely on public policy to implicitly drive the decisions regarding the role renewable resources should play in the portfolio of programs offered. This option would allow the inclusion of renewable resources that do not meet the cost-effectiveness tests in the program portfolio-based on public policy. However, when reporting the value of the energy saved and the benefit/cost ratio, renewable resources would continue to be undervalued because non-energy benefits exclusive to renewable resources would not be included.

ICG and WUA recommend Alternative One. Both state that there is no basis to treat renewable resources differently than energy efficiency because there are no significant or uniquely different benefits between the two resources. JPI and WECC recommend Alternative Four. JPI states that customer-sited renewable resources have been adopted by the state of Wisconsin as a matter of public policy and that judgment regarding the value of attributes specific to renewable resources is needed to ensure policy objectives are met.

Alternative One: Status quo. The cost-effectiveness of renewable resources should be determined in the same manner as energy efficiency.

Alternative Two: It is appropriate, when evaluating the cost-effectiveness of renewable resources, to use a modified Expanded test that appropriately values non-energy benefits exclusive to renewable resources. Commission staff shall work with interested parties to develop recommendations regarding the appropriate benefit components and values to use.

Alternative Three: It is appropriate to use the same measure of cost-effectiveness for renewable resources as for energy efficiency, but the cost-effectiveness threshold of renewable resources should be established at less than 1.0. Choose one of the following:

a) A threshold number, such as 0.75; or

b) Require Commission staff to work with interested parties to develop a recommendation regarding the appropriate threshold.

Alternative Four: The cost-effectiveness of renewable resources should be determined in the same manner as energy efficiency, but public policy should dictate the extent to which renewable resources that are not cost-effective should be included in the portfolio of programs in order to meet public policy objectives.

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